

## Safety-Oriented BST Brake Module

Edition 04/2008

16614011 / EN

# Operating Instructions





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## 1 General Information

### 1.1 How to use the operating instructions

The operating instructions are an integral part of the product and contain important information on operation and service. The operating instructions are written for all employees who assemble, install, startup, and service this product.

The operating instructions must be accessible and legible. Make sure that persons responsible for the system and its operation, as well as persons who work independently on the unit, have read through the operating instructions carefully and understood them. Consult SEW-EURODRIVE if you have any questions or if you require further information.

### 1.2 Structure of the safety notes

The safety notes in these operating instructions are structured as follows:

Symbol	<b>SIGNAL WORD!</b>
 General hazard	<p>Nature and source of hazard.</p> <p>Possible consequence(s) if disregarded.</p> <ul style="list-style-type: none"> <li>• Measure(s) to avoid the hazard.</li> </ul>

Symbol	Signal word	Meaning	Consequences if disregarded
Example:  General hazard	<b>HAZARD!</b>	Imminent hazard	Severe or fatal injuries
 Specific hazard, e.g. electric shock	<b>WARNING!</b>	Possible hazardous situation	Severe or fatal injuries
	<b>CAUTION!</b>	Possible hazardous situation	Minor injuries
	<b>CAUTION!</b>	Possible damage to property	Damage to the drive system or its environment
 NOTE	<b>NOTE</b>	Useful information or tip. Simplifies handling of the drive system.	

**1.3 Rights to claim under limited warranty**

A requirement of fault-free operation and fulfillment of any rights to claim under limited warranty is that you adhere to the information in the operating instructions. Consequently, read the operating instructions before you start working with the unit!

Make sure that the operating instructions are available to persons responsible for the plant and its operation, as well as to person who work independently on the unit. You must also ensure that the documentation is legible.

**1.4 Exclusion of liability**

You must comply with the information contained in these operating instructions to ensure safe operation of the BST and to achieve the specified product characteristics and performance features. SEW-EURODRIVE assumes no liability for injury to persons or damage to equipment or property resulting from non-observance of these operating instructions. In such cases, any liability for defects is excluded.



## **2 Safety Notes**

The following basic safety notes are intended to prevent injury to persons and damage to property. The operator must ensure that the basic safety notes are read and observed. Make sure that persons responsible for the system and its operation, as well as persons who work independently on the unit, have read through the operating instructions carefully and understood them. If you are unclear about any of the information in this documentation, please contact SEW-EURODRIVE.

### **2.1 Preface**

This document contains safety-related conditions and addendums for the operation of BST with safe disconnection of the brake,

- according to stop category 0 to EN 60204-1
- Conformance with safety category 3 according to EN 954-1
- Compliance with performance level d according to EN ISO 13849-1
- Protection against restart in accordance with EN 1037

Also consider the supplementary safety notes in the individual sections of these operating instructions.

### **2.2 General information**

Never install or start up damaged products. Submit a complaint to the shipping company immediately in the event of damage.

All work related to transportation, storage, setup/mounting, connection, startup, maintenance and repair may only be carried out by qualified personnel, in strict observation of:

- the relevant detailed operating instructions
- the warning and safety signs
- all other project planning documents, operating instructions and wiring diagrams belonging to the drive
- The specific regulations and requirements for the system
- The national/regional regulations governing safety and the prevention of accidents

The requirements for the safety switching device and the permitted circuit variants are specified in detail in section "Requirements for external safety switching devices" (see page 13) and must be strictly observed.

The system/machine manufacturer must perform a system/machine-specific risk analysis. This is to take into account the BST and the mechanical brake design.

Removing covers without authorization, improper use as well as incorrect installation or operation may result in severe injuries to persons or damage to property.

Refer to the documentation for additional information.



### **2.3 Target group**

Only qualified electricians are permitted to perform installation, startup, fault repair and servicing (observe IEC 60364 or CENELEC HD 384 or DIN VDE 0100 and IEC 60664 or DIN VDE 0110 as well as national accident prevention regulations).

Qualified electricians in the context of these basic safety notes are persons familiar with installation, assembly, startup and operation of the product who possess the required qualifications.

Any activities regarding transportation, storage, operation, and disposal must be carried out by persons who have been instructed appropriately.

### **2.4 Designated use**

The BST safe brake module is responsible for the power supply and control of disc brakes from SEW-EURODRIVE. The BST is intended for industrial systems and may only be used in accordance with the information provided in SEW-EURODRIVE's technical documentation and the information given on the nameplate. For the approved combination of BST and SEW disk brake, refer to chapter "Permitted combinations" (see page 17).

### **2.5 Transport**

Immediately upon receipt, inspect the shipment for any damage that may have occurred during transportation. Inform the shipping company immediately. It may be necessary to preclude startup.





## **2.6 Installation/assembly**

Observe the notes in section "Mechanical Installation" (see page 21)!

## **2.7 Startup/operation**

- When the safety-related control voltage  $V_{24V\ safe}$  is disconnected, the supply voltage  $V_Z$  is still present at the BST module.
- The safety concept is only suitable for performing mechanical work on the system/machine components.
- All poles must be disconnected from the supply system when work is carried out on the electrical section of the system. Dangerous voltages may still be present for up to 10 minutes after disconnection from the power supply source.
- You have to take into account that, in case of a fault, the application time of the connected brake is longer, thus the drive may coast.
  - For the maximum application times, refer to chapter "Technical Data" of the operating instructions for the BST and the SEW disk brakes.
  - Note: Should the coasting result in application-dependent hazards, you have to provide for additional protective measures (e.g. movable covers with closure) that cover the respective area until persons are no longer in danger.
  - The additional protective covers must be designed and integrated to meet the requirements stipulated in EN ISO 12100-1 and the requirements determined for the machine based on the risk analysis.
  - After activating the stop command, access to the machine must remain blocked until the drive has reached standstill, or the access time has to be determined to ensure that an adequate safety distance is maintained.

## **2.8 Inspection/maintenance**

Observe the notes in chapter "Inspection/Maintenance" (see page 26)!

## **2.9 Disposal**

Dispose the BST in accordance with the material structure and the regulations in force for instance as:

- Iron
- Copper
- Aluminum
- Plastic



### 3 Safety Concept

- In case of danger, any potential risk resulting from a machine must be eliminated as quickly as possible. Standstill with restart prevention is generally the safe condition for preventing dangerous movements.
- For drive systems, this state is achieved by activating the STO (Safe Torque Off) function according to IEC 61800-5-2. With the BST, it is possible to use the same safety-oriented signal that activates the STO function to provide for a safe brake application.
- The BST brake module is characterized by the connection option of terminal 5/6 to an external fail-safe, prototype examined emergency stop relay. The safety switching device disconnects the safe control voltage  $V_{24V\ safe}$  when a connected control device (e.g. EMERGENCY STOP button with latching function) is activated.
- Disconnecting the safe control voltage  $V_{24V\ safe}$  means the connected brake is disconnected from the power supply. The brake cannot be released because the required power supply for creating a magnetic field is safely interrupted.
- Instead of separating the brake control galvanically from the power supply using contactors or switches, the disconnection procedure described here prevents the power semiconductors in the BST from being activated, thus ensuring safe disconnection. This means that all connected brakes are de-energized although the supply voltage is still present at the BST.
- The requirements for the external safety switching device are clearly defined in the following sections and must be observed.
- **Using a suitable external circuit via a safety control with**
  - approval to at least EN 954-1 category 3

**allows for operating the BST module with safe disconnection according to stop category 0 to EN 60204-1, fail-safe protection against restart according to EN 1037 and fulfillment of safety category 3 to EN 954-1.**
- **Using a suitable external circuit via a safety control**
  - approved for EN ISO 13849-1, performance level d or EN 61508, SIL 2

**allows for operating the BST module with safe disconnection according to stop category 0 to EN 60204-1, fail-safe protection against restart according to EN 1037 and fulfillment of performance level d to EN ISO 13849-1.**
- The classification to category 3 according to EN 954-1, or performance level d according to EN ISO 13849-1 applies to the control not to the brake. The risk analysis for the machine will show whether the application requires one or two brakes, for safety reasons.



## **4 Safety Conditions**

The following conditions are mandatory for the installation and operation of the BST module in applications with safe disconnection of the drive according to stop category 0 to EN 60204-1, fail-safe protection against restart to EN 1037 and conformance with safety category 3 to EN 954-1 or performance level d to EN ISO 13849-1. The requirements are divided into the following sections:

- Installation requirements (see page 11)
- Requirements for external safety switching devices (see page 13)
- Startup requirements (see page 14)
- Operation requirements (see page 14)

### **4.1 Installation requirements**

Observe the following notes for applications with safety-oriented disconnection of the BST.

- Safety-oriented control voltage  $V_{24V\ safe}$  (or safety-oriented disconnection) refers to the cable between the safety relay and the BST at terminals 5 and 6.
- The cables must be installed according to EMC requirements:
  - Outside an electrical installation space, shielded cables must be routed permanently (fixed) and protected against external damage.
  - Individual conductors can be routed inside an electrical installation space.
  - The total cable length between the safety control system (e.g. safety switching device) and the BST module is limited to a maximum length of 100 m for EMC reasons.
  - Wiring technology must comply with EN 60204-1.
- Connect the shield to the electronics shield clamp over a large area.
- You have to make sure that there is no transient coupling to the safety-related control voltage  $V_{24V\ safe}$ .
- Power lines and the safety-related control cable  $V_{24V\ safe}$  have to be installed in separate cable ducts.
- The total cable length between the BST module and the connected brake must not exceed 200 m.
- Do not interconnect brake cables of different brake control systems.



## Safety Conditions

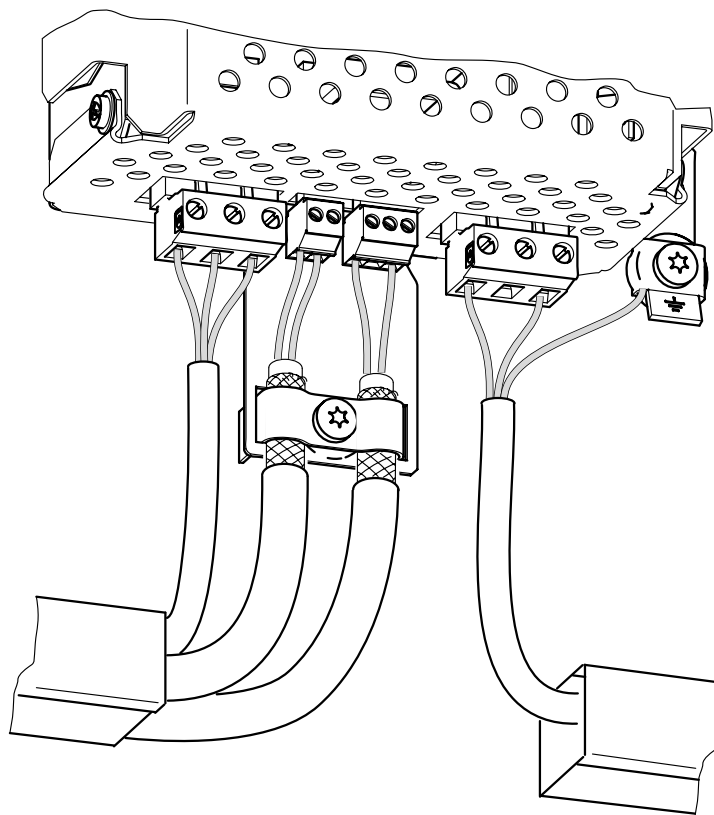
### Installation requirements

- For disconnection of group drives, observe the switching capacity of the safety switching device and the maximum permitted voltage drop on the safety-related control voltage  $V_{24V\ safe}$ .
- Observe the notes in the BST operating instructions on EMC compliant cabling. It is essential that you apply the shielding at both ends on the housing.
- Only use voltage sources with safe disconnection (SELV/PELV) in accordance with VDE 0100 for the safety input at terminals 5 and 6.

According to EN 60950-1, the voltage between the outputs or between any output and a ground part must not exceed 60 V DC voltage for longer than 0.2 s after only one fault. The maximum DC voltage must be 120 V.

- Adhere to the technical data of the BST module and the brake.

The following figure shows EMC compliant installation.



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## 4.2 Requirements for external safety relays

The following requirements apply to safety relays:

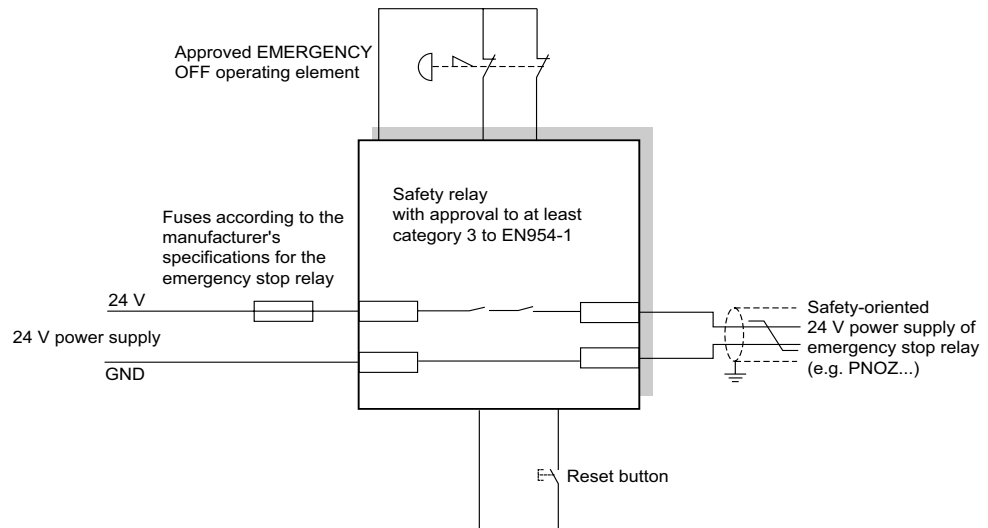
- If the entire application has to meet the requirements of safety category 3 according to EN 954-1, then the safety relay must be approved at least to safety category 3 according to EN 954-1.
- If the entire application has to meet the requirements of performance level d according to EN ISO 13849-1, then the safety relay must be approved at least to performance level d according to EN ISO 13849-1 or SIL 2 according to EN 61508.
- The safety-oriented control voltage  $V_{24V\ safe}$  can be safely disconnected either at the positive, or the positive and negative pole.
- If the safety-oriented control voltage  $V_{24V\ safe}$  is exclusively disconnected at the positive pole and wired outside an electrical installation space, we recommend to also route the ground of the control voltage  $V_{24V\ safe}$  and lay it within the shield.
- The values specified for the safety relays must be adhered to when designing the circuit.
- The switching capacity of the safety relays must correspond at least to the maximum permitted limited output current of the safety-related control voltage  $V_{24V\ safe}$ . **Observe the manufacturer's instructions for the safety relays concerning the permitted contact loads and fusing that may be required for the safety contacts. Unless specified otherwise, the contacts must be protected with 0.6 times the nominal value of the maximum contact rating specified by the manufacturer.**
- The safety relays must be designed and connected in such a way that resetting the control device itself will not lead to a restart.



#### 4.2.1 "Safety relay" sample circuit

The following figure shows the basic connection of an external safety relay (according to the before mentioned requirements).

Observe the information in the respective manufacturer's data sheets for connection.



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#### 4.3 Startup requirements

- Startup must be documented and proof of the efficacy of the safety functions is required.
- Startup checks of the disconnecting device and the correct wiring must be basically performed and documented for the BST module with safe disconnection of the drive according to stop category 0 to EN 60204-1, fail-safe protection against restart to EN 1037 and compliance with safety category 3 according to EN 954-1 or performance level d to EN ISO 13849-1.
- At startup, the safety-related control voltage  $V_{24V\ safe}$  must be included in the functional test.

#### 4.4 Operation requirements

- Operation is only allowed within the limits specified in the data sheets. This applies to both the external safety relay as well as the BST.
- The safety functions must be checked at regular intervals to ensure the flawless functionality. The test intervals should be specified in accordance with the risk analysis.



## 5 Unit Design

### 5.1 Nameplate, unit designation

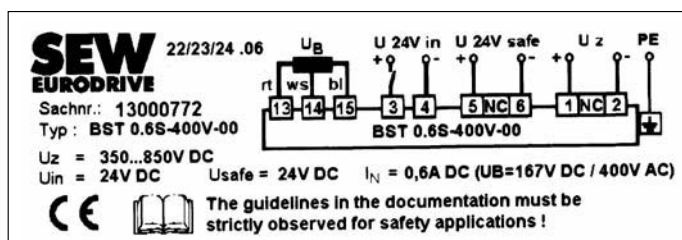
#### 5.1.1 Example: Unit designation

#### BST 0.6 S - 400V - 00

Version/design	
Brake Voltage	400V = AC 400 V (DC 176 V) 230V = AC 230 V (DC 96 V)
Design	S = Control cabinet module I = Integrated module
Rated output current	0.6 = DC 0.6 A 1.0 = DC 1.0 A
Series	

#### 5.1.2 Example: Nameplate

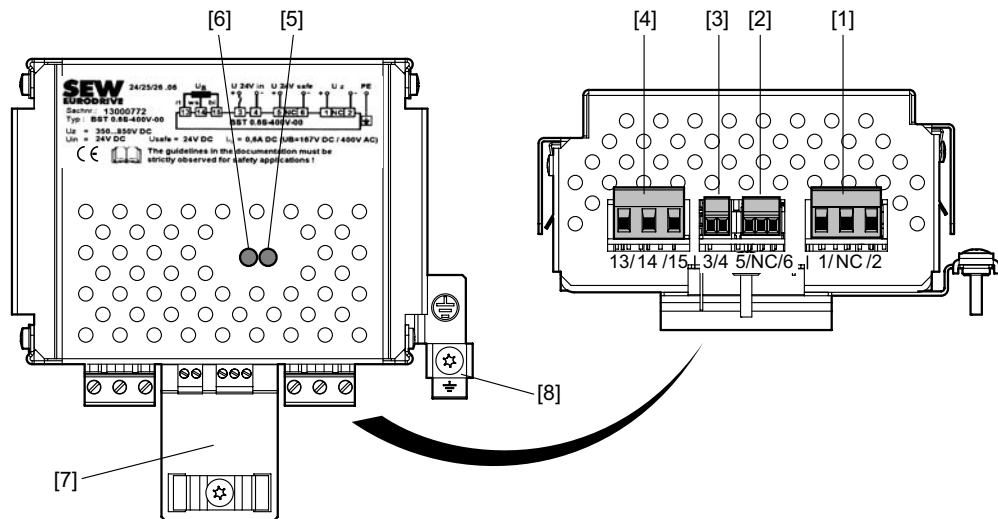
BST 0.6S-400V-00





## 5.2 Unit design – control cabinet version

Unit design of BST 0.6S-400V-00 and BST 1.0S-230V-00.



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- [1] Terminals X1: For connecting the power supply line
- [2] Terminals X2: For connecting the safety-oriented control cable
- [3] Terminals X3: For connecting the control cable
- [4] Terminals X4: For connecting the brake cable
- [5] LED V2 for indicating the operating state
- [6] LED V1 for indicating the operating state
- [7] Retaining plate/shield plate
- [8] PE connection

## 5.3 Terminal assignment

Terminal		Function
X1:1	+V <sub>Z</sub>	DC link connection
X1:2	-V <sub>Z</sub>	
X2:5	SVI24	DC+24 V input "Safe stop" (safety contact)
X2:6	SOV24	Reference potential for DC+24 V input "Safe stop" (safety contact)
X3:3	DBI24	Brake input
X3:4	DGND	Reference potential for binary signals
X4:13	RD	Brake output
X4:14	WH	
X4:15	BU	





## 5.4 Approved unit combinations

The following unit combinations are permitted for applications with safe disconnection according to stop category 0 to EN 60204-1, fail-safe protection against restart to EN 1037 and compliance with safety category 3 according to EN 954-1 or performance level d to EN ISO 13849-1.

**Only approved SEW disk brakes may be connected to the BST module.**

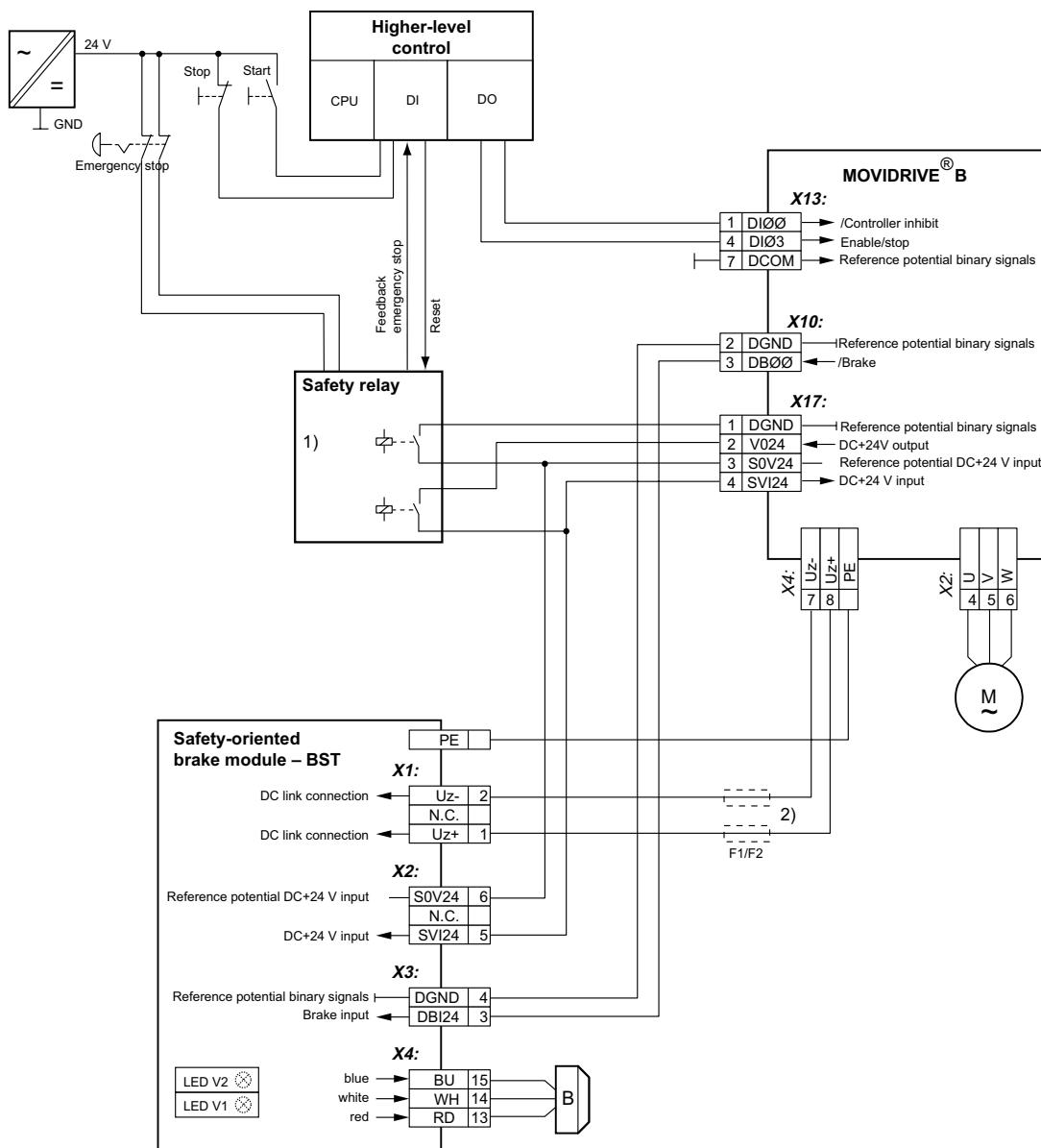
Unit designation	Part number	Approved SEW disk brakes
<b>BST 0.6S-400V-00</b>	<b>1300 0772</b>	All brake coils with a coil voltage of AC 400 V and a coil power $\leq 95$ W.
<b>BST 0.6I-400V-00</b>	<b>1270 3842</b>	Several brake coils can be connected for redundant systems. In this case, the total power must not exceed 95 W.
<b>BST 1.0S-230V-00</b>	<b>1300 1337</b>	All brake coils with a coil voltage of AC 230 V and a coil power $\leq 100$ W.
<b>BST 1.0I-230V-00</b>	<b>1270 5101</b>	Several brake coils can be connected for redundant systems. In this case, the total power must not exceed 100 W.



## 6 Applications

### 6.1 Disconnection of single drives via inverter

The following figure shows the block diagram for stop category 0 with brake activation.



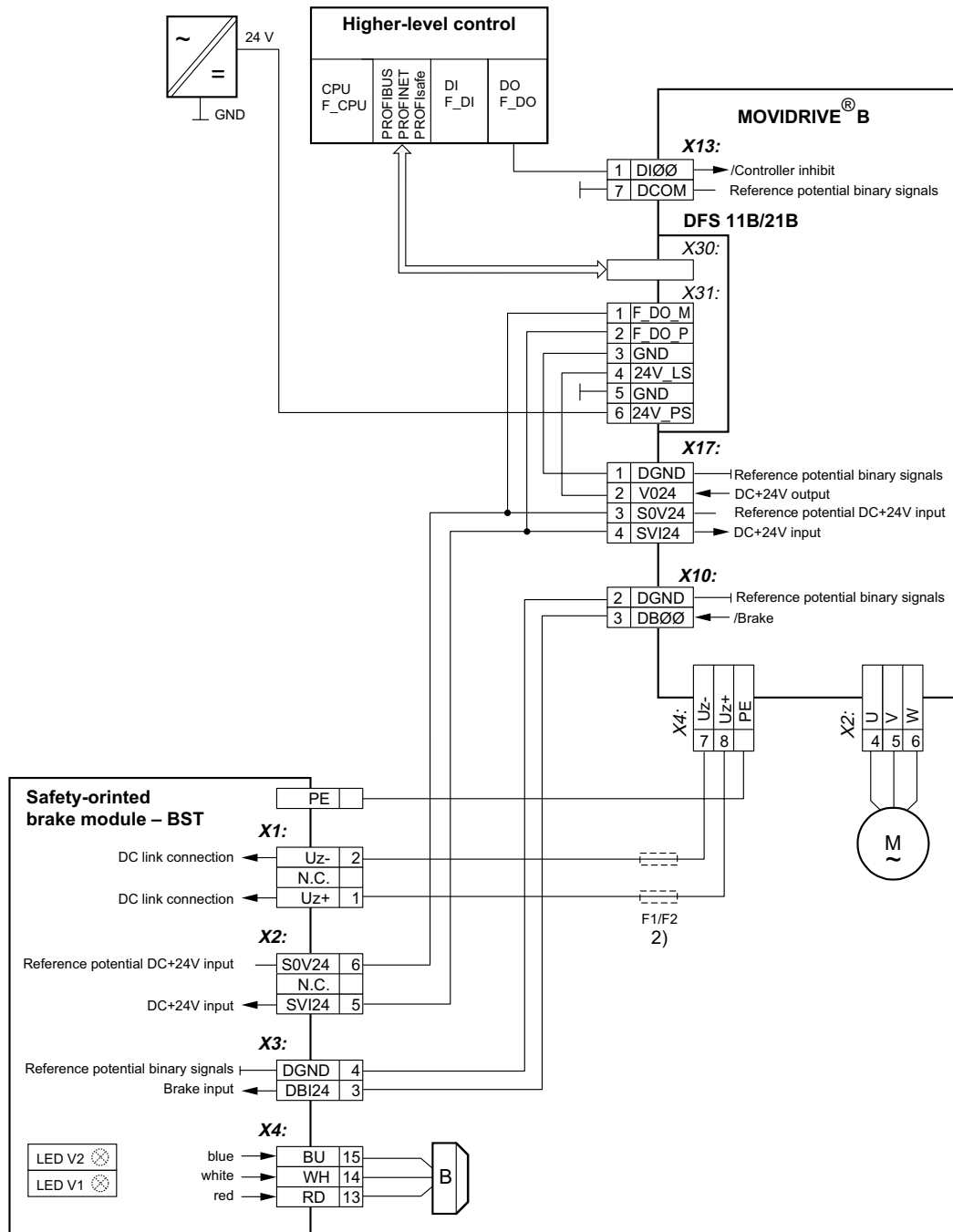
133670923

- 1) For the safe one-pole and two-pole disconnection, refer to chapter "Electrical Installation" (see page 22)
- 2) Fusing is not required if the before mentioned requirements for the supply cable are met. Observe chapter "Electrical Installation" (see page 22).



## 6.2 Disconnection of single drives via inverter and DFS fieldbus interface

The following figure shows the block diagram for the disconnection of single drives via inverter and DFS.



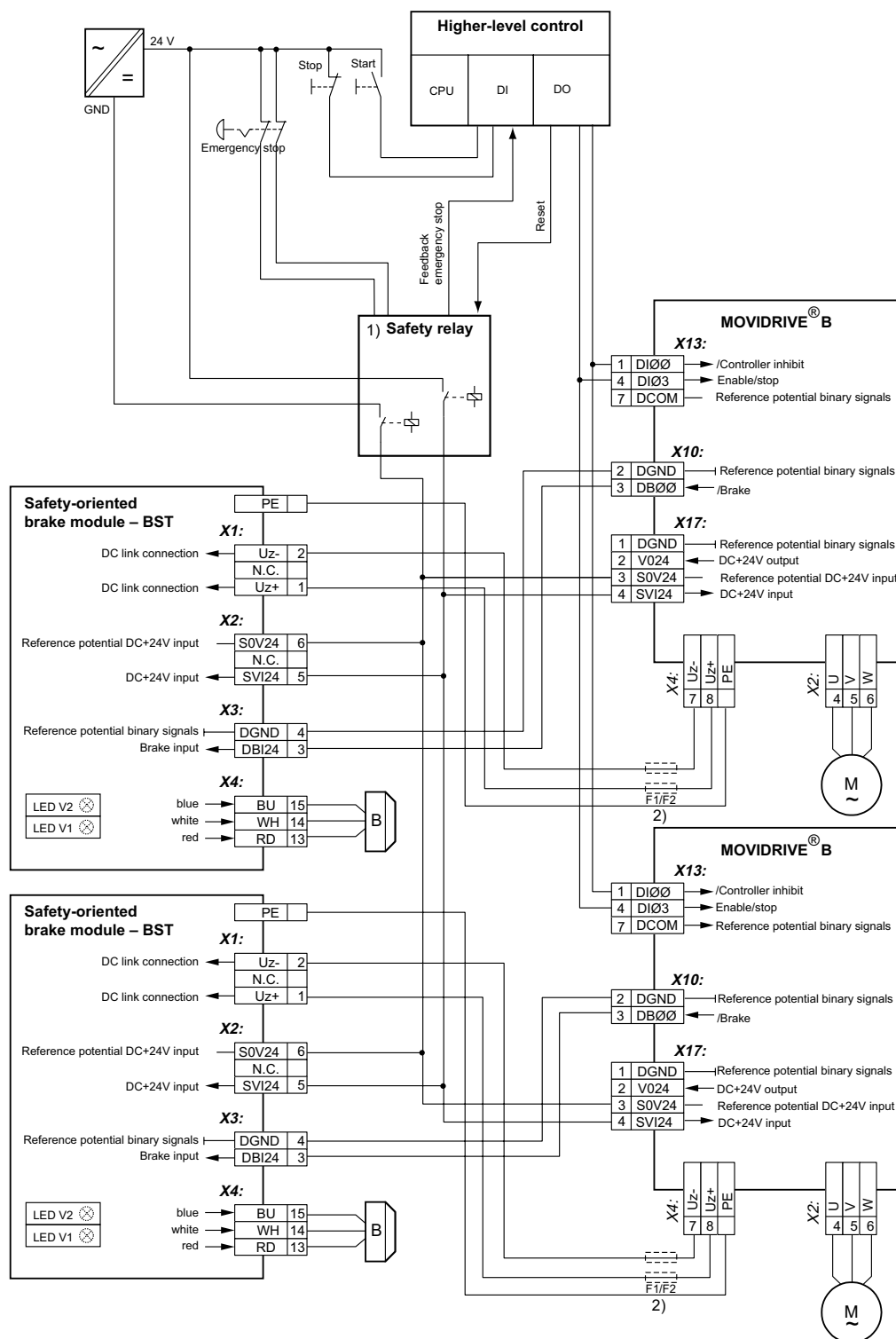
780937611

- 1) For the safe one-pole and two-pole disconnection, refer to chapter "Electrical Installation" (see page 22)
- 2) Fusing is not required if the before mentioned requirements for the supply cable are met. Observe chapter "Electrical Installation" (see page 22).



### 6.3 Group disconnection via inverter

The following figure shows the block diagram for stop category 0 with brake activation.



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- 1) For the safe one-pole and two-pole disconnection, refer to chapter "Electrical Installation" (see page 22)
- 2) Fusing is not required if the before mentioned requirements for the supply cable are met. Observe chapter "Electrical Installation" (see page 22).

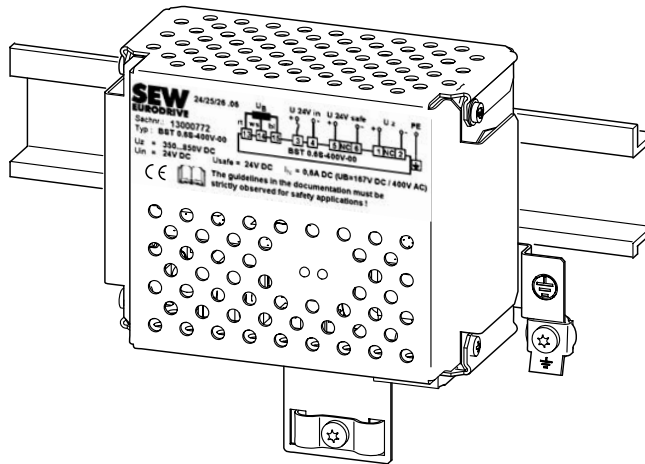


## 7 Installation

### 7.1 Mechanical Installation

#### 7.1.1 DIN rail mounting

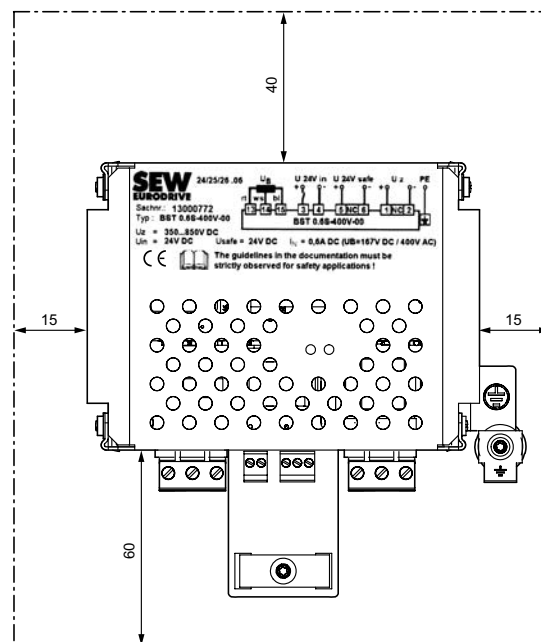
The BST module is mounted onto a DIN rail in the control cabinet.



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#### Minimum clearance and mounting position

- Leave 40 mm clearance at the top, 60 mm at the bottom and 15 mm at the sides for optimum cooling. Make sure air circulation in the clearance is not impaired by cables or other installation equipment.
- Ensure unobstructed cooling air supply and make sure that air heated by other units cannot be drawn in or reused.
- Install the units vertically only. You must not install them horizontally, tilted or upside down.



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## 7.2 Electrical installation

### 7.2.1 Notes on electrical installation

*Supply cable (terminal 1+2)*

The supply cable must meet the following conditions:

- The supply cables to the BST carry a high DC voltage (max. DC 900 V). The rated voltage of the cable must amount to at least  $V_0/V = 300 \text{ V} / 500 \text{ V}$  (in accordance with DIN VDE 0298).
- The inverter supply system must have a grounded star point (TNS/TNCS). The operation is not permitted for IT networks or systems grounded via an outer conductor.
- Cable cross section:  $0.75 \text{ mm}^2 - 2.5 \text{ mm}^2$
- Max. cable length: 100 m
- All poles of the supply cable are protected with two corresponding DC fuses F1/F2 (recommended  $1000 \text{ V} / 4 \text{ A}$ ).



#### NOTE

The fuses may not be required in compliance with VDE 100 part 430 and EN 60204-1 part 430 if the supply cable to the BST is protected by the input fuse located in front of the inverter, or if the following conditions are met:

- Cable length to the BST as short as possible (max 3 m)
- Cables not laid in the vicinity of inflammable substances
- Risk of short circuit reduced to a minimum; use largest possible cross section

*Control cable (terminals 3+4)*

The control cable must meet the following conditions:

- Cable cross section  $0.5 - 1.5 \text{ mm}^2$
- Max. cable length: 100 m

*Control cable (terminals 5+6)*

The safety-oriented control cable must meet the following conditions:

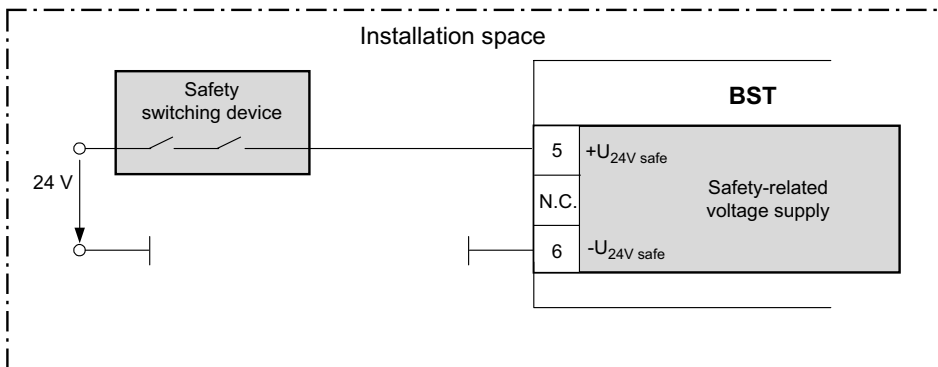
- Cable cross section  $0.5 - 1.5 \text{ mm}^2$
- Max. cable length: 100 m

*Brake cable (terminals 13,14,15)*

- Cable cross section  $0.75 - 2.5 \text{ mm}^2$
- Max. cable length: 200 m

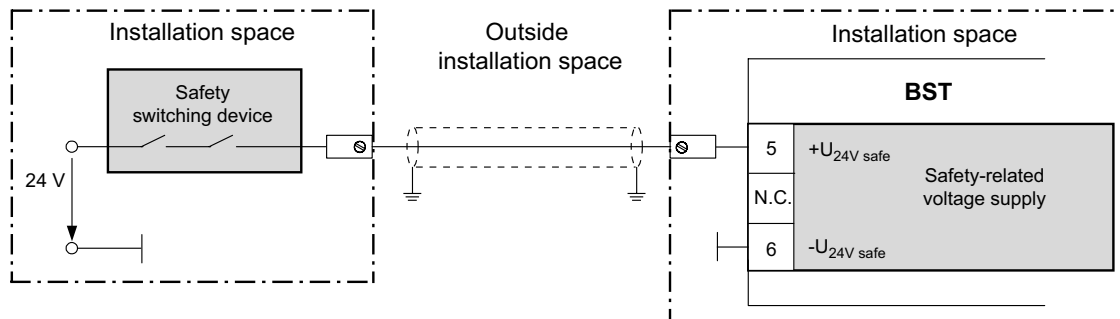


## 7.2.2 Safe single-pole disconnection



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Figure 1: Safe single-pole disconnection, wiring inside an electrical installation space



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Figure 2: Safe single-pole disconnection, wiring outside an electrical installation space

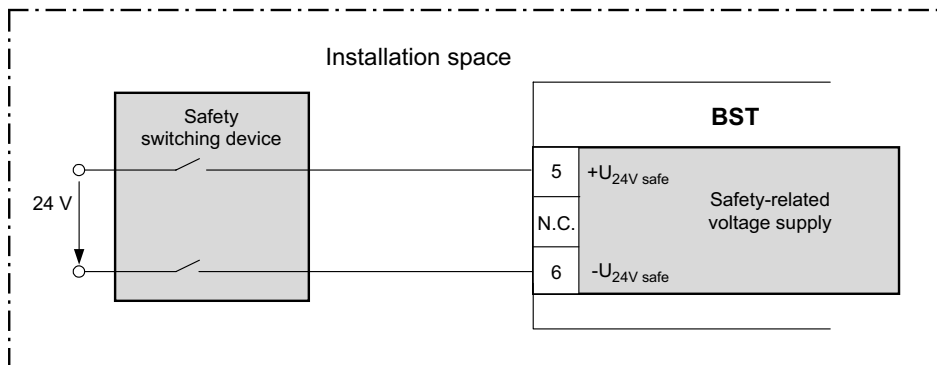


### NOTE

The safe single-pole disconnection is only permitted when short circuits in the connection cable between safety relay and BST can be ruled out (fault elimination to EN 13849-2)

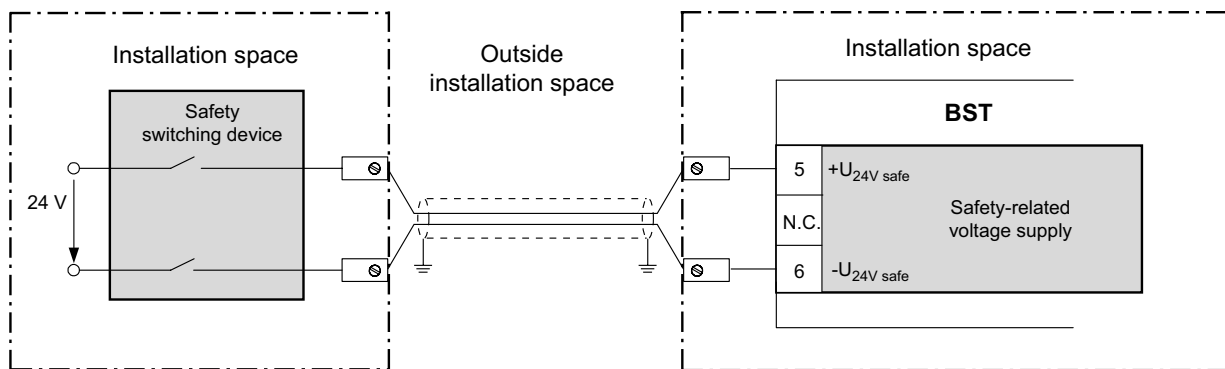


### 7.2.3 Safe double-pole disconnection



133783435

Figure 3: Safe double-pole disconnection, wiring inside an electrical installation space



133814027

Figure 4: Safe double-pole disconnection, wiring outside an electrical installation space





## 8 Startup/Operation

### 8.1 Operating status

The brake is energized when the supply voltage  $V_Z$ , the safety-oriented control voltage  $V_{24V\ safe}$  and the control voltage  $V_{24V\ in}$  are present.

- The brake is energized when the supply voltage  $V_Z$  and the safety-oriented control voltage  $V_{24V\ safe}$  are present, the brake is activated via the control voltage  $V_{24V\ in}$  :

$V_{24V\ in} = \text{On} = \text{Brake released}$

$V_{24V\ in} = \text{Off} = \text{Brake applied}$

- If the safety-oriented control voltage  $V_{24V\ safe}$  is disconnected, the brake is safely de-energized.
- If the supply voltage  $V_Z$  is disconnected, the brake is de-energized.

The brake is released via a high-speed excitation, which means that the coil section of the brake (red – white) is supplied with the brake voltage  $V_B$  for about 100 ms. Then the complete brake coil (red – blue) is supplied with the brake voltage  $V_B$ . The brake always applies when there is a DC and AC switch-off controlled via the control voltage  $V_{24V\ in}$  or the safety-oriented control voltage  $V_{24V\ safe}$ .

The response time for releasing and applying the brake results from the response time of the BST  $t_R \leq 6\ ms$  and the response or application time of the brake connected. For the response or application times, refer to the operating instructions of the SEW disk brakes.

#### 8.1.1 Operating display

The LEDs indicate the operating state of the control inputs.

$V_{24V\ safe}$	$V_{24V\ in}$	LED V1	LED V2	Operating status
Off	Off	Off	Off	Brake de-energized
Off	On	Off	Off	Brake de-energized
On	Off	Lights orange	Off	Brake de-energized
On	On	Lights orange	Lights green	Brake energized when $V_Z$ is present



## 9 Inspection/Maintenance

	<p><b>HAZARD!</b></p> <p>Risk of crushing if the hoist falls.</p> <p>Severe or fatal injuries.</p> <ul style="list-style-type: none"> <li>• Secure or lower hoist drives (danger of falling)</li> <li>• Isolate the inverter, the motor and the brake from the power supply before starting work, safeguarding them against accidental startup.</li> <li>• Only use genuine spare parts in accordance with the valid parts list.</li> <li>• Always install a new brake controller at the same time as replacing the brake coil!</li> <li>• Observe the notes in the operating instructions for AC motors and brakemotors.</li> <li>• Only qualified personnel may perform maintenance for the brake.</li> </ul>
	<p><b>HAZARD!</b></p> <p>There may still be dangerous voltages inside the unit and at the terminal strips after the BST has been disconnected from the power supply.</p> <p>Severe or fatal injuries from electric shock.</p> <ul style="list-style-type: none"> <li>• Prior to maintenance or inspection work, make sure that the unit is completely de-energized.</li> </ul>
	<p><b>CAUTION!</b></p> <p>The surface temperatures on the drive can be very high during operation.</p> <p>Danger of burns.</p> <ul style="list-style-type: none"> <li>• Let the motor cool down before you start your work.</li> </ul>

### 9.1 Inspection and maintenance intervals

The required inspection/maintenance intervals must be calculated by the system manufacturer according to the specific project planning documents for individual applications, in accordance with the regionally valid standards.



## **9.2    *Checking the functionality of the brake***

A functional test according to the instructions by the system manufacturer is required after inspection/maintenance work.

## **9.3    *Service***

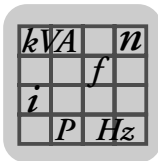
Please have the following information available if you require customer service assistance:

- Nameplate data (complete)
- Type and extent of the problem
- Time the problem occurred and any accompanying circumstances
- Assumed cause

## **9.4    *Replacing the unit***

Proceed as follows to replace a BST:

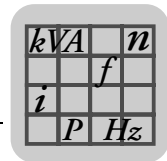
- Observe the notes regarding inspection/maintenance work for the BST.
- Compare the data on the nameplate of the BST to be replaced with the new one.
- Remove the four connection terminals (X1 - X4).
- Disconnect the PE and the shield clamps.
- Push lightly on the opposite side of the connection terminals and remove the BST from the DIN rail.
- Install the new BST on the DIN rail. Observe chapter "Mechanical Installation".
- Connect the PE and the shield.
- Connect the four terminals (X1 - X4).



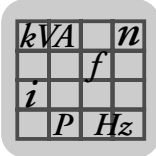
## 10 Technical Data

### 10.1 General technical data

Brake module	BST 0.6S-400V-00 (control cabinet)	BST 1.0S-230V-00 (control cabinet)	BST 0.6I-400V-00 (built-in version)	BST 1.0I-230V-00 (built-in version)
Part number	1300 0772	1300 1337	1270 3842	1270 5101
Interference resistance	according to EN 61800-3			
Interference emission with EMC-compliant installation	according to EN 61800-3			
Degree of protection	IP20		IP00	
Installation	in the control cabinet on a DIN rail		MOVIPRO PHCx0Axxx unit series Mounted on heat sink with heat sink compound	
Ambient temperature $T_U$	-15°C ... +45°C		-15°C ... +55°C at $P_{ab}$ = 100% see diagram 1	-15°C ... +55°C at $P_{ab}$ = 100% see diagram 2
Power supply $V_Z$ Terminals 1, 2	350 ... DC 850 V			
Supply power $P$ Terminals 1, 2	Power consumption: 120 W, depending on brake type (holding coil) short-term acceleration power: max. 300 W / 150 ms (accelerator coil)			
Control voltage $V_{24V in}$ Terminals 3, 4	Signal level according to DIN EN 61131-2 type 1 (section 5.2.3) DC + 15V ... +30 V ( > 2 mA ) => 1 / closed contact DC -3V ... +5 V ( < 2 mA ) => 0 / open contact Only use voltage sources with safe disconnection (SELV/PELV) in accordance with VDE 0100 for the control input at terminals 3 and 4.			
Safety-oriented control voltage $V_{24V safe}$ Terminals 5, 6	DC 24 V -15% / +20% (range: DC 20.4 V ... DC 28.8 V / < 50 mA ) according to DIN EN 61131-2 (section 5.1.1.1) DC 24 V			
Brake voltage $V_B$ Terminals 13, 15  (SEW brake type)	DC 167 V  (AC 400 V)	DC 96 V  (AC 230 V)	DC 167 V  (AC 400 V)	DC 96 V  (AC 230 V)
Rated output current $I_N$ Terminals 13, 15	DC 0.6 A	DC 1.0 A	DC 0.6 A	DC 1.0 A
Acceleration current $I_B$ Terminals 13, 14	4 ... 8.5 times the holding current, depending on the brake type			
Max. output power $P_{ab}$ Terminals 13, 15	$P_{ab} \leq 95 \text{ W}$	$P_{ab} \leq 100 \text{ W}$	$P_{ab} \leq 95 \text{ W}$	$P_{ab} \leq 100 \text{ W}$
Brake output Terminals 13, 14, 15	The figures relate to the SEW standard brake coils (two-coil system) Holding coil: Terminal 13 <sub>red</sub> - 15 <sub>blue</sub> Accelerator coil: Terminal 13 <sub>red</sub> - 14 <sub>white</sub> Several brake coils can be connected for redundant systems. The sum of the individual power levels must not exceed the max. output power.			



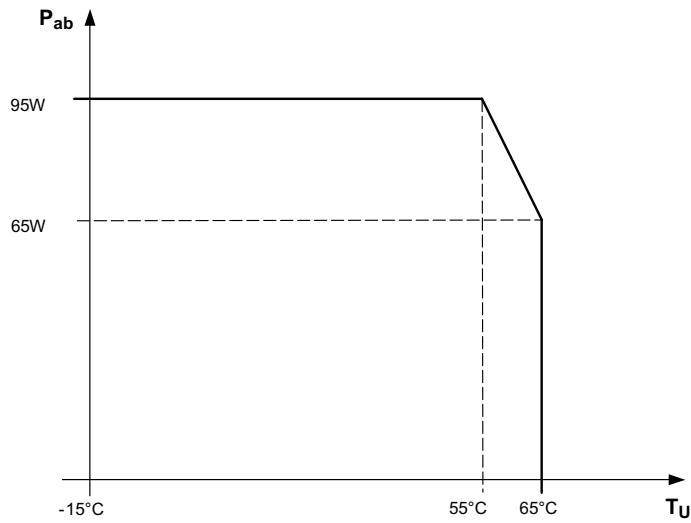
Brake module	BST 0.6S-400V-00 (control cabinet)	BST 1.0S-230V-00 (control cabinet)	BST 0.6I-400V-00 (built-in version)	BST 1.0I-230V-00 (built-in version)
<b>Supply cable</b> (terminals 1+2) <b>V<sub>Z</sub></b>	Rated cable voltage: min. $V_0 / V = 300 \text{ V} / 500 \text{ V}$ (to DIN VDE 0298) Cable cross section: $0.75 \text{ mm}^2 - 2.5 \text{ mm}^2$ Max. cable length: 100 m			
	Connector: Phoenix GMSTB 2.5/ 3-ST		Connector: Flat plug 2.8x1 + insulating housing	
<b>Control cable</b> (terminals 3+4) <b>V<sub>24V in</sub></b>	Cable cross section: $0.5 - 1.5 \text{ mm}^2$ Max. cable length: 100 m Connector: Phoenix MC 1.5/ 2-ST-3.5			
<b>Control cable</b> (terminals 5+6) <b>V<sub>24V safe</sub></b>	Cable cross section: $0.5 - 1.5 \text{ mm}^2$ Max. cable length: 100 m Connector: Phoenix MC 1.5/ 3-ST-3.5			
<b>Brake cable</b> (terminals 13,14,15)	Cable cross section $0.75 - 2.5 \text{ mm}^2$ . Max. cable length: 200 m with min. $1.5 \text{ mm}^2$			
	Connector: Phoenix GIC 2.5/ 3-ST-7.62		Connector: Flat plug 2.8x1 + insulating housing	
<b>Power loss</b> <b>P<sub>V</sub></b>	Max. 20 W			
<b>Highest possible safety category</b>	Performance level d according to EN ISO 13849-1 Safety category 3 according to EN 954-1			
<b>System structure</b>	Diagnostics via an external safety relay (1oo2)			
<b>failure per hour (MTTF value)</b>	The safety relay determines the given values (MTTF, DC, CCF) for calculating the failure probability of one or several safety circuits. The BST has no effect on this.			
<b>Service life (EN 61508)</b>	500,000 switching cycles (brake released and brake applied) or max. 20 years			
<b>Safe status</b>	Brake de-energized			
<b>Storage temperature</b>	-20 °C...+70 °C (EN 60721-3-3, class 3K3)			
<b>Dimensions W × H × D</b>	134 x 70 x 135mm		121.5 X 59 x 88mm	
<b>Weight</b>	about 730 g		about 600 g	



## 10.1.1 Ambient temperature ( $T_U$ ) for the built-in version

Diagram 1

BST0.6I-400V-00

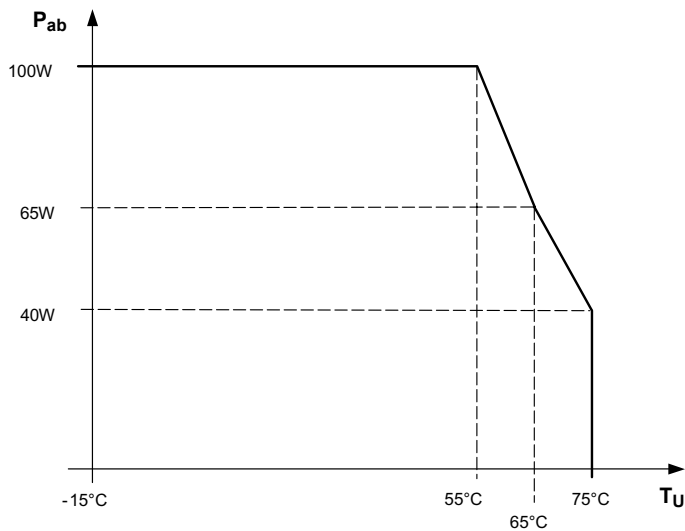


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$P_{ab}$  = max. output power  
 $T_U$  = ambient temperature

Diagram 2

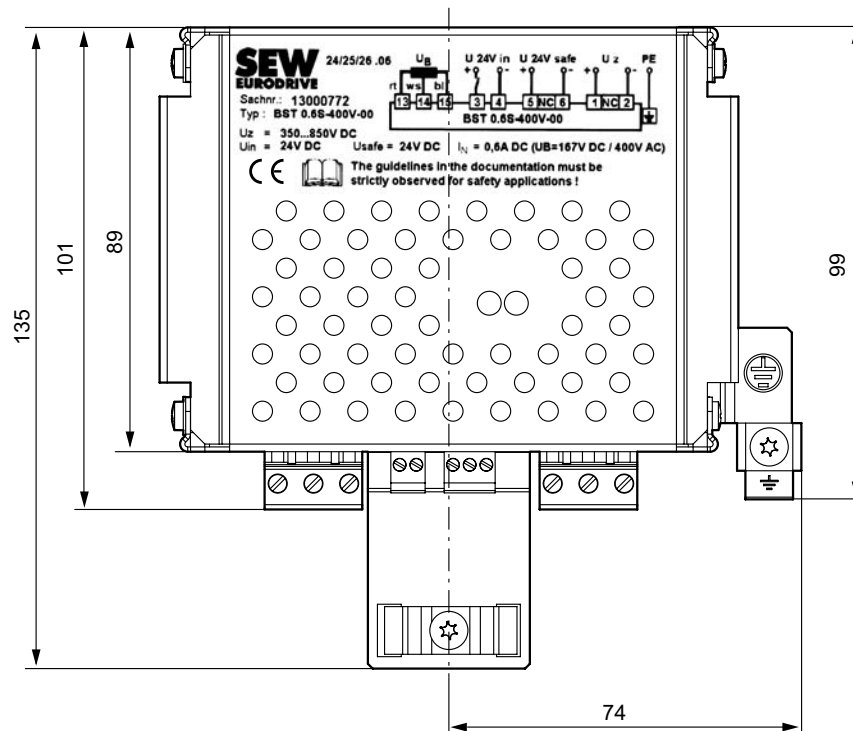
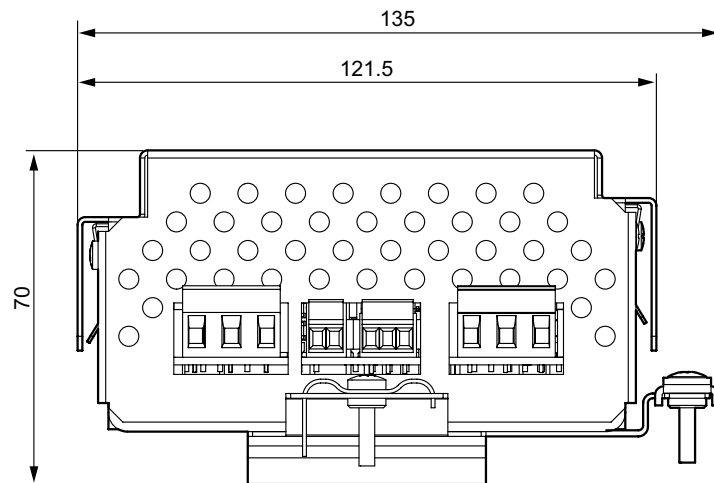
BST1.0I-230V-00



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$P_{ab}$  = max. output power  
 $T_U$  = ambient temperature

## 10.2 Dimension sheets of the BST in control cabinet design

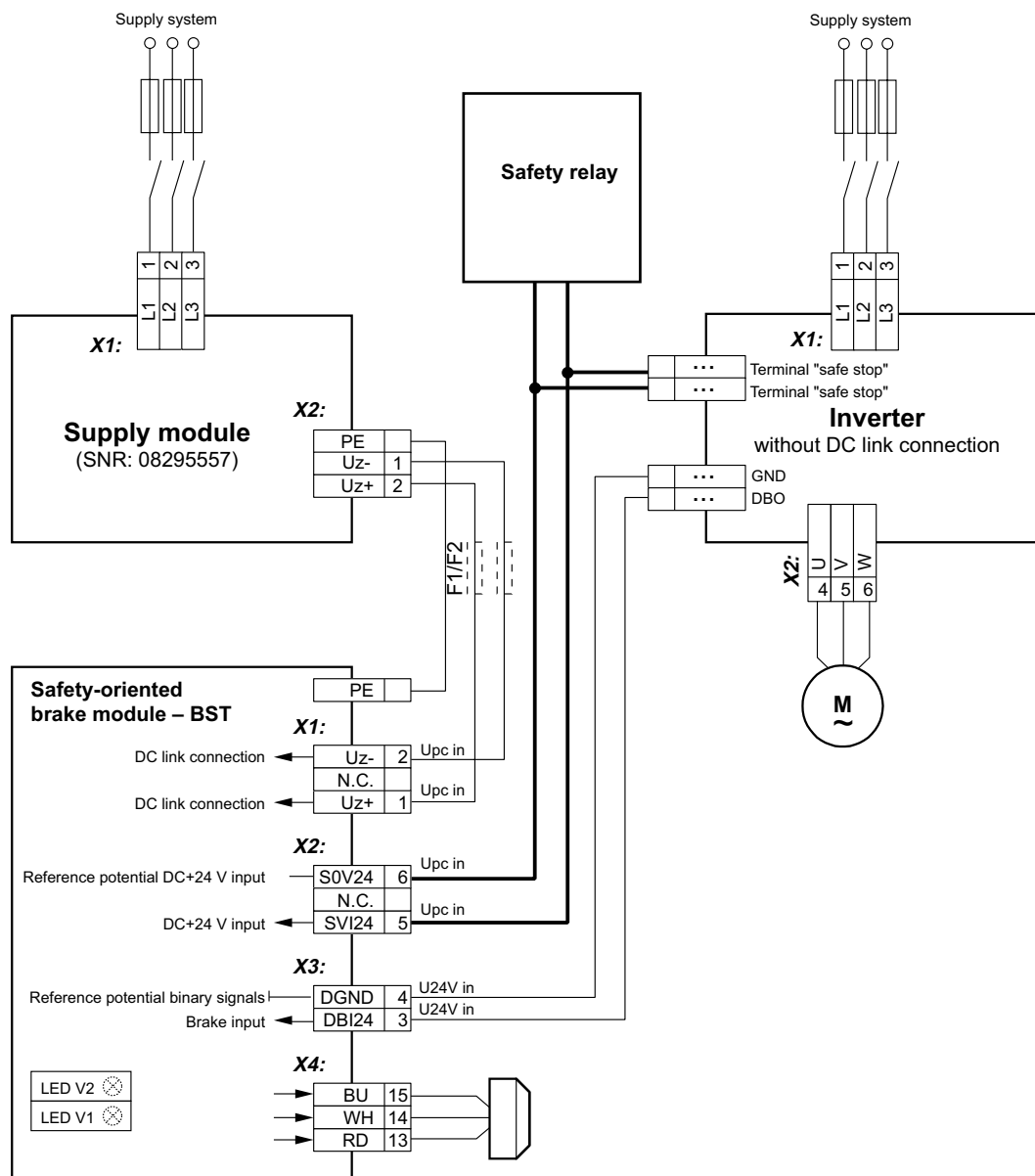




## 11 Accessories

### 11.1 BST supply module

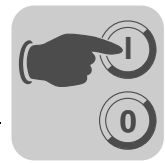
Supply module for supplying the BST from a separate supply system.



780890763

- 1) Fusing is not required if the before mentioned requirements for the supply cable are met. Observe chapter "Electrical Installation" (see page 22).





## 12 Checklist

### 12.1 Using the checklist

The checklist helps you perform project planning, installation and startup for the connection variants described above.



#### NOTE

- **Correct use of the checklists and the connection-specific addendums can meet the requirement for documented startup and proof of the efficacy of the safety functions.**
- **Additional requirements may arise depending on the system.**
- **The checklist is not exhaustive.**

No.	Requirement	Met		Comment
		Yes	No	
<b>1</b>	<b>General requirements</b>			
1.1	Has a risk analysis according to EN 1050/ EN ISO 14121-1 been performed that proved: <ul style="list-style-type: none"> <li>• that safety category 3 can be realized?</li> <li>• that the performance level d can be realized?</li> <li>• which stop category (0 or 1) must be realized to EN 60204-1?</li> </ul>			
<b>2.</b>	<b>General demands on units and installation</b>			
2.1	Do all the DC 24 V voltage sources/power supply units used comply with EN 60950-1?			
2.2	Have the notes regarding EMC-compliant wiring been observed?			
2.3	Was the safety-oriented control voltage $V_{24V\ safe}$ installed as follows? <ul style="list-style-type: none"> <li>• EMC-compliant cabling (i.e. routed separately from motor cables and other cables carrying switched-mode signals)</li> <li>• Either in cable ducts or conduits</li> <li>• Or using shielded cables</li> <li>• Using suitable terminal strips for the distribution.</li> </ul>			
<b>3.</b>	<b>Requirements for external safety relays</b>			
3.1	Has the safety switching device in use at least approval according to safety category 3 to EN 954-1, EN 61508 SIL 2, or performance level d to EN ISO 13849-1?			
3.2	Have the values specified for the stop relay been strictly observed in the circuit design?			
3.3	Has the switching capacity of the emergency stop relay been taken into account and corresponding fusing been carried out?			



## Checklist

### Using the checklist

No.	Requirement	Met		Comment
		Yes	No	
<b>4.</b>	<b>Startup requirements</b>			
4.1	Have you checked the connection for the signals displayed in the connection variants?			
4.2	Has a commissioning test of the disconnecting device been carried out and the correct wiring been checked and recorded in writing?			
4.3	Has the operating display been included in the functional test during startup?			
<b>5.</b>	<b>Operation requirements</b>			
5.1	Can the units/components in the safety area be operated within the limits specified in the data sheets?			
5.2	Is the safety function checked at regular intervals?			



## 13 Address List

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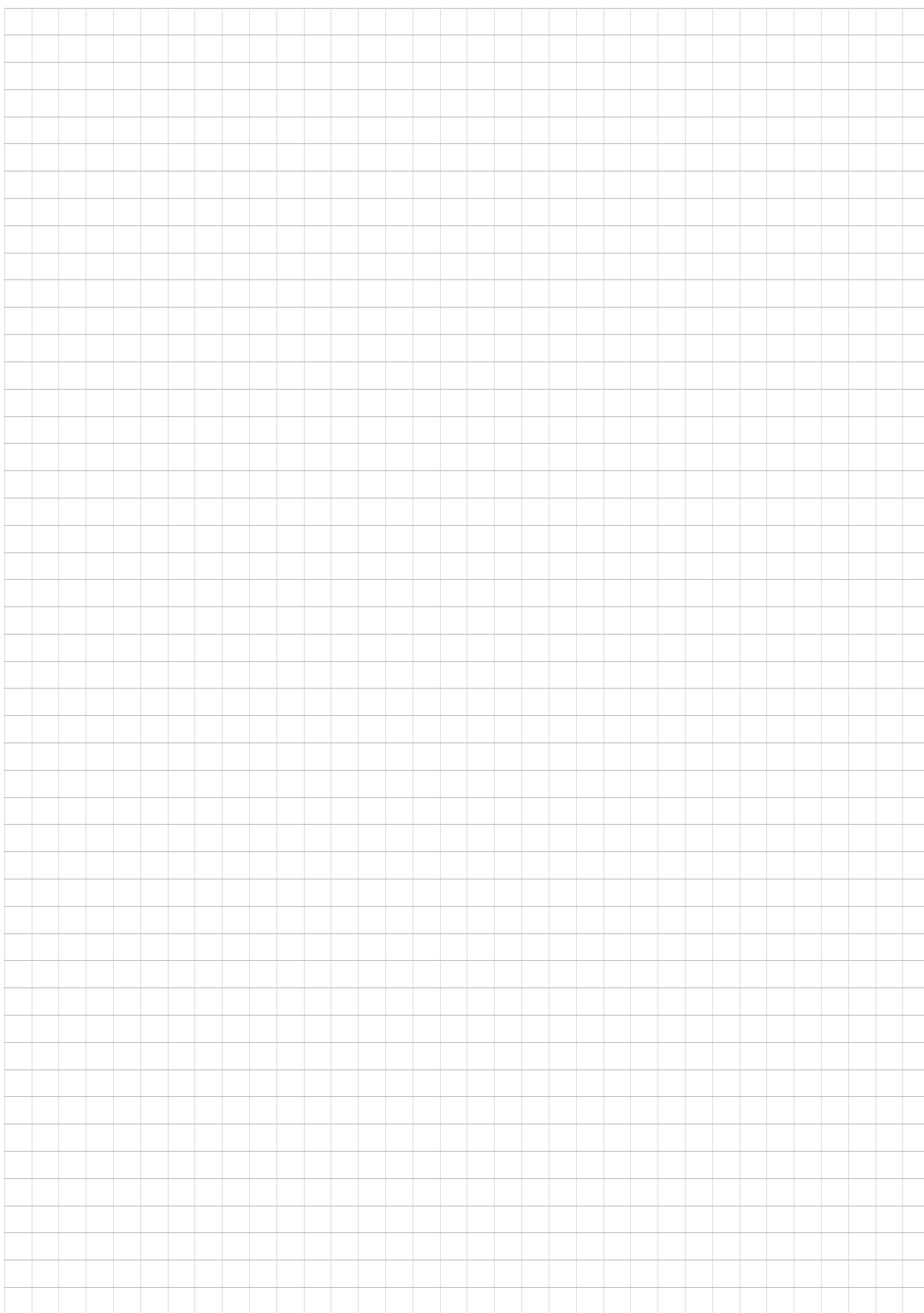
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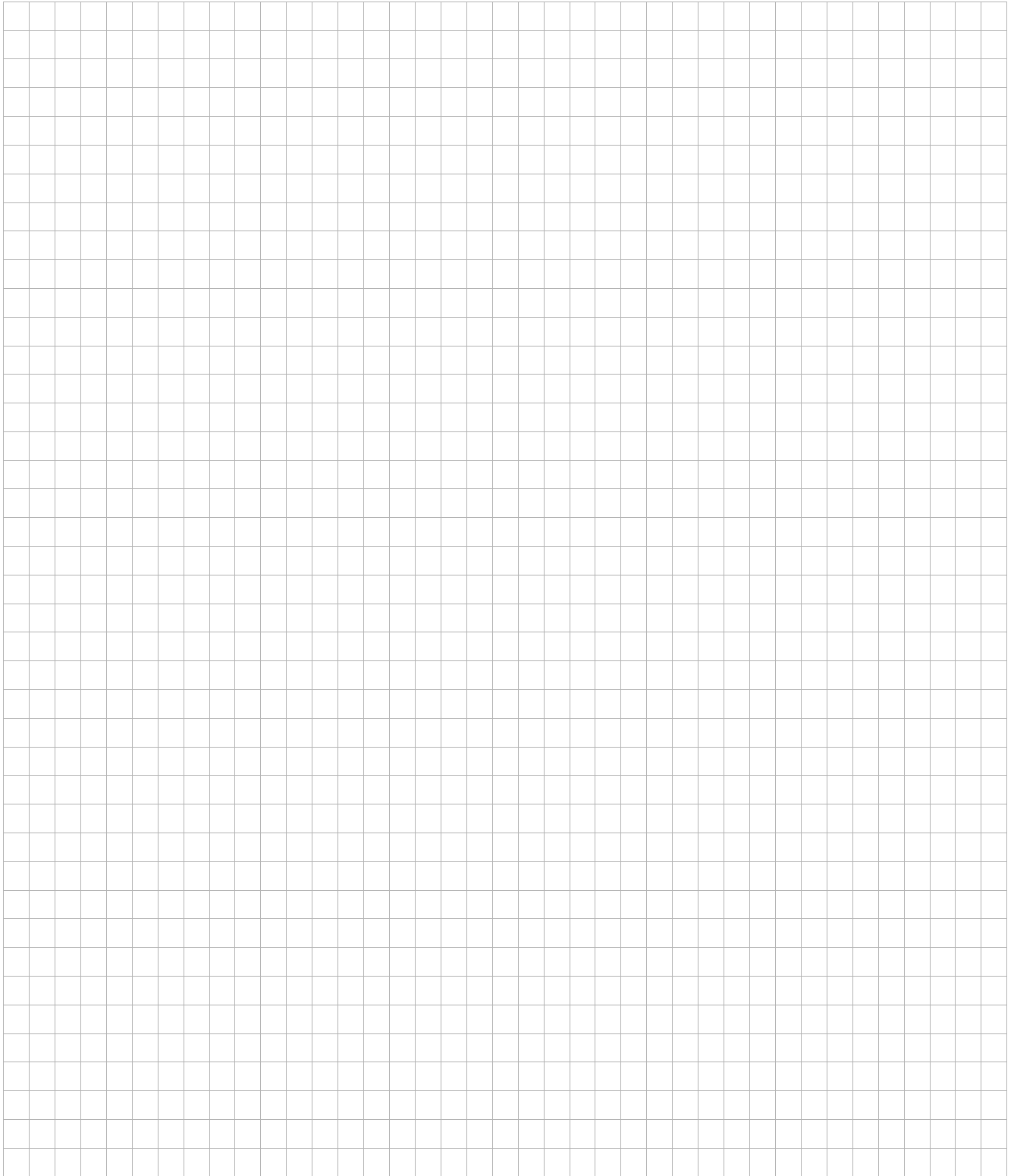
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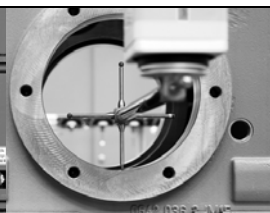
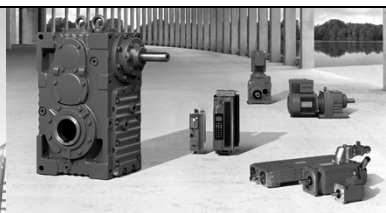
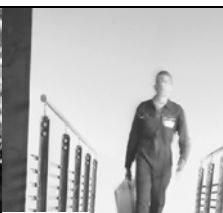
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